

## Chapter I

01 July 1997

### Joint Engineer Fundamentals

“Engineers, both Army and Seabees were under Commander Construction Troops who, in turn, was under the Island Commander, Major General Fred C. Wallace, USMC. Airfield construction and supply roads had priority; other base developments could wait until the island was secured. The face of the island was changed more than it had been for thousands of years by multi-lane roads, traffic circles, water points, quonset villages, tank farms, storage dumps, and hospitals.”

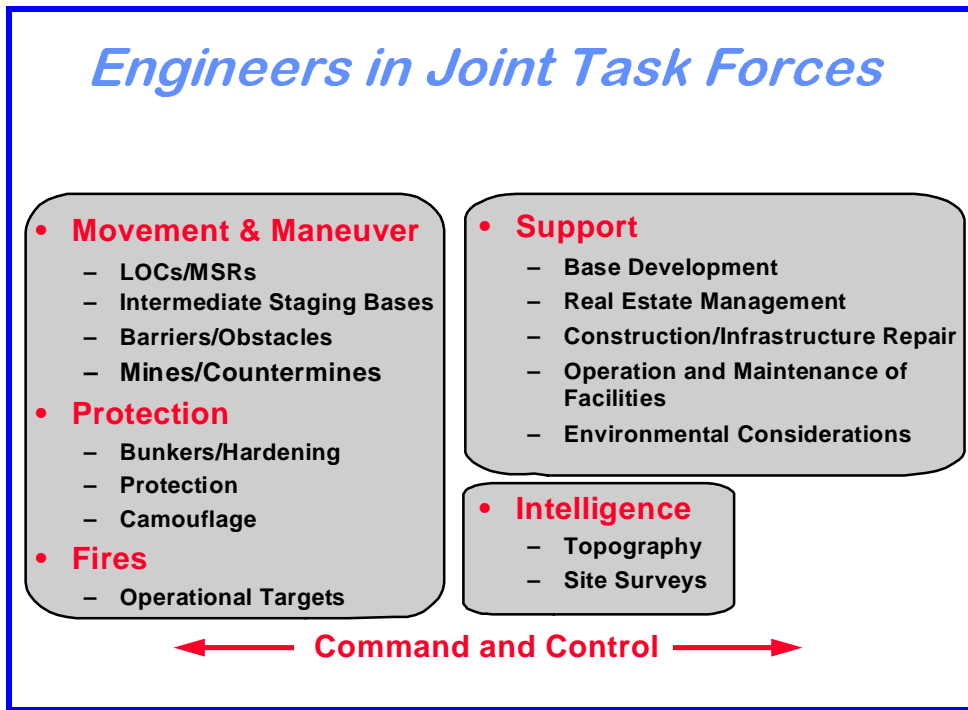
*Okinawa Secured-- “Victory in the Pacific”  
Samuel Eliot Morison  
History of US Naval Operations in WWII*

#### 1. General/Introduction.

a. **Military Engineering in Support of National Objectives.** America’s Armed Forces are smaller than they have been since the demobilization at the end of World War II. And we have decreased the percentage of our forces permanently overseas. Faced with flat budgets and increasingly more costly readiness and modernization, the success of future operations will depend on how effective commanders are in employing limited engineer resources across both Military Operations Other than War (MOOTW) and wartime operations. Success, in absolute terms and in costs (casualties and dollars), can only be accomplished through the seamless integration of all available service capabilities (including engineering). To achieve this integration, we must be fully joint-- institutionally, organizationally, intellectually, and technically. Future commanders must be able to visualize and create the “best fit” of available forces needed to produce the immediate effects and achieve the desired results. This publication is an extension of **Joint Pub 3-33 *Joint Force Capabilities***. This publication focuses upon joint engineer doctrine harnessing all engineering functions. Toward this end, the total engineer force of both active and reserve, civilian and contractor, constitute the primary resources that commanders can bring to bear in accomplishing the mission. And, if we apply the experiences of the Gulf War, Somalia, Haiti, and Bosnia as indicators of future military operations, engineer operations will include the presence of large numbers of Department of Defense civilians as well as the services of nongovernmental organizations (NGOs), private volunteer organizations (PVOs), international organizations (IOs), as well as other US Government agencies.

b. **Functions of Joint Engineering.** The joint force commander plans and conducts engineer operations in support of his overall concepts of operations, intelligence, and logistics. The joint force commander will have a mix of engineering capabilities. The relative mix of capabilities will depend upon the mission. Each service has certain engineer capabilities and units that are optimized for service missions. These capabilities are applied against the land, the air, and the sea components of the commander-in-chief’s

campaign plan. **Joint Pub 3-0, *Doctrine for Joint Operations*** describes the fundamentals of joint warfare. Within the context of the joint operational environment, engineer operations develop the means for tactical maneuver as well as strategic and operational movement, provides support to logistics and sustainment operations, builds topographic data bases and terrain visualization, constructs protective fortifications, enhances quality of life, and prepares the transition to war termination operations. **Combat engineering** is an integral part of the joint force commander's ability to apply dominating maneuver. Army and Marine Corps combat engineers normally conduct operations as an integrated part of maneuver forces. Combat engineers "shape" the battlefield by enhancing the mobility of our forces and by taking it away from the enemy. Combat engineers gain, maintain and exploit advantages that focus and enhance the shock



and effectiveness of combined arms operations. Engineer units conduct breaching, bridging, and diving operations to overcome obstacles emplaced by the enemy or encountered as a feature of the terrain; assault across beaches and against fortified positions; emplace obstacles to deny mobility to enemy forces and enhance the effects of friendly fires; and provide combat trails and forward aviation operating areas to enhance the tactical mobility of the combat force. **Topographic engineering** is the provision of certain elements of geospatial information and services (GI&S) to operational commanders and staffs at all echelons throughout the range of operations. Topographic engineer units provide operational and tactical terrain analyses, nonstandard map products, and survey data to combat, combat support, and combat service support forces in all phases of operations throughout the theater. **Civil engineering** are those combat support and combat service support activities that identify, design, construct, lease, or provide facilities, and which operate, maintain, and perform war damage repair and other engineering functions in support of military operations. Engineer units identify, assess, upgrade, repair, and construct facilities required for force projection and force Reception,

Staging, Onward movement, and Integration (RSO & I). During deployment and the conduct of operations, engineer units provide construction and repair of airfields and ports, lines of communication, and logistics facilities, as well as fire-fighting, well-drilling, and diving functions.

c. **Special Considerations.** Recent military operations, especially *Operation Desert Storm* and in Somalia, Haiti, and Bosnia, would indicate that some issues become critical concerns of commanders because of external political factors. Some of these factors can be mitigated through engineer operations.

(1) **Force Protection.** An astute enemy will attempt to play with American sensitivity to casualties. This sensitivity is especially acute when vital interests of the United States are not directly affected by the operation. All engineer units play important roles in **force protection** operations. They analyze the terrain to best utilize its intrinsic protection, and construct protective structures such as berms, revetments, obstacles, fortifications, specially-designed and reinforced buildings, and sophisticated facility alarm systems. Engineers help protect the force from a spectrum of threats-- including crimes of opportunity directed against US personnel and property, terrorists acts and weapons of mass destruction. At the installation, the engineer is responsible for facilities camouflage, concealment, and deception.

(2) **Post Conflict Operations.** Engineering is a vital component of **post-conflict** operations. Engineers have major roles in support to redeployment of the force and environmental restoration and may be tasked to support nation building. In redeployment of the force, engineers prepare facilities for “reverse RSO&I,” construct wash racks to clean vehicles before shipping back to station, and prepare collection points for hazardous materials. In environmental restoration, engineers support cleanup of the battlefield and removal of hazardous materiel and toxic materials. Engineer support to foreign governments is determined by U.S. political interests and objectives in the stabilization of the region.

2. **Doctrine for Joint Engineer Operations.** Joint Publication 3-34 is the first document describing engineer support to joint operations. This publication describes doctrine for engineer operations in joint or multinational operations. The publication presents options for the Joint Force Commander to consider in the planning and execution of engineer operations that parallel, support, and enhance the strategic goal and the campaign plan.

3. **Engineer Preparation of the Theater.** The process of building military power in or near the theater of operations generates combat and construction (civil) engineering requirements. Facilities and infrastructure at the reception end of the deployment process may be adequate, or they may be nonexistent, or any condition in between. Engineer preparation of the theater is a prerequisite for force closure within an Area of Operations and sets the stage for subsequent decisive operations. Engineer Preparation of the Theater is a mix of combat and construction engineering. Civil engineering are those combat support and combat service support activities that identify, design, construct, lease, or

provide facilities, and which operate, maintain, and perform war damage repair and other engineering functions in support of military operations. Combat engineering is the application of close combat skills designed to produce or enhance the mobility, countermobility, and survivability of tactical units in direct contact with an enemy. Adequate engineering preparation will save American lives.

**a. Facilities Acquisition.** Facilities acquisition covers the spectrum of real estate leasing to new construction. At the joint level, the combatant commander is responsible for setting theater construction policies, prioritization guidance in conformance with the concept of operations, and facilities standards. Component commanders are responsible for planning, prioritizing, and coordinating their facilities requirements in a manner consistent with the combatant commander's guidance. Facilities are fundamental to RSO&I, sustainment of logistics, and some combat operations. To the extent that the host nation infrastructure does not support initial or sustained operations, engineers will be required to make improvements to facilities and to maintain those facilities. To the extent that local governments are capable of maintaining or improving infrastructure, agreements may be made for their support.

**b. Engineer Cross-Service and Common Service Support.** Under the combatant commander's directive authority for logistics, the CinC may direct a component commander to provide some manner of engineering support to other component commanders in theater. This authority could apply to construction materials and/or projects. The CinC would exercise this authority when one or more components lack the capability to support the concept of operations. In some situations, inter-service funding may be required.

**4. Unified Actions, Joint Warfare and Engineers.** Unified action goes beyond the concept of "joint operations" and has the broader connotation of the **synchronized application of all of the instruments of national and multinational power**. It includes the engineer activities of nonmilitary organizations as well as military forces.

**a. Engineering Resources.** All Joint Force Commanders are responsible for unified engineer actions and will ensure that their joint operations are synchronized in time, space, and purpose with the engineer operations of other military forces (US military organizations such as the US Army Corps of Engineers, the Naval Facilities Engineering Command, and the National Imagery and Mapping Agency; contractors employed by these agencies and the joint force commander; and multinational engineers to include those of the host nation) and civil agencies and nongovernmental organizations. Nonmilitary organizations with engineer capabilities may include the Agency for International Development and nongovernmental organizations such as religious relief agencies, corporations, and international agencies such as the International Red Cross.

**b. Command and Control of the engineer elements of Joint Forces.** The joint force commander receives staff support from the Joint Force Engineer (JFE). Because of the breadth of engineer activities spanning the fields of operations, intelligence, and logistics,

the JFE is not subordinated to an operational or support staff officer. The joint force commander normally exercises COCOM or OPCON authority through the service component commander. As part of the joint effort, each service component commander employs a variety of engineer units to execute combat, topographic, and general engineering functions. The **JFE is normally delegated coordinating authority** to coordinate between the capabilities brought to the theater by the various services and military agencies.

**5. Basic Organization of Engineer Forces.** The Army and Marine Corps have **dedicated, organic combat engineer units** to execute missions at corps and division level. These units operate as part of a combined arms team in habitual support relationships. Combat engineers are an integrated component of the division (or other warfighting unit) and are trained and equipped to execute combat tasks. Their capabilities for construction range from very limited to nonexistent. Assigning construction missions to these units would require significant additional equipment and training. Units employed in topographic and general engineering missions have **utility across all services**. Services may provide mutual support in operations such as construction, firefighting, utilities operation, and terrain analysis. It is in these areas, the joint force commander and JFE can exercise prioritization to best influence the joint effort. In some cases, **one type of unit may have functional capabilities in both general engineering and combat engineering**. For example, a battalion with horizontal construction equipment may upgrade airfields in the theater's communications zone, or may dig fighting positions for tanks and dismounted infantry on the forward edges of the battlefield. The joint force commander and service component commanders must weigh the costs and benefits of employing such units in either role.

**6. The Force Multiplier Effect of Engineer Operations.** Engineer operations pave the way for subsequent decisive military operations. Whether aimed from near (combat engineers in a combined arms task force) or from afar (construction engineers developing CONUS force projection platforms), engineers focus on the decisive campaign plan. There are other considerations. Americans are quite sensitive about casualties. An astute enemy will attempt to create situations that cause the American people to question the human costs of commitment. During Engineer Preparation of the Battlefield, engineers expend sweat to preclude loss of blood later on. In *Military Operations Other than War*, engineer operations are frequently the primary objective of the campaign plan. When its full range of capabilities are employed, military engineering can be a significant force multiplier for the combatant commander. It aids overall success by shaping to best advantage, a variety of conditions under which military operations or military operations other than war must be conducted.

**a. *Engineering is critical for preparing the theater.*** When military forces of the United States are called upon to support our national interests, we must have the capability to project elements of power from the continental United States or from

overseas bases into the area of operations. Projecting and building-up forces requires such infrastructure as airfields, ports, roads and bridges, water sources, electrical power, and much more. The build-up of forces requires either adequate pre-existing infrastructure, or rehabilitation and construction of new facilities.

***b. Each Service has engineering units and capabilities to meet specific Service needs, but can provide common-use engineering at the theater level.***

Each Service has a unique engineering capability arising from their different Title 10 responsibilities. The Army and the Marine Corps have both combat and construction engineer units. Air Force and Navy engineers perform base construction and repair work. The Host Nation has certain engineering capabilities. Hired contractors frequently provide construction support. This mixed bag of capabilities and arrival/set up times can be managed across service lines.

**Fundamental to the nature of joint operations is the need to tailor force packages and command structures to suit the situation at hand.**

***c. Engineering Preparation of the Battlespace sets the stage for subsequent decisive operations and an adequate engineer preparation will save American and allied lives and money.*** When we prepare the battlespace by using engineering capabilities, we can:

- Increase the rate of force build-up.
- Minimize force footprint and facilitate “split-basing.”
- Ensure needed resources are available for campaign execution.
- Protect the Force from weapons of mass destruction.
- Expedite decisive operations.
- Prepare for war termination operations, political resolution, and reconstitution and return of American forces.

## 7. *Joint Engineering Principles*

- The most efficient use of scarce engineer resources is achieved through centralized coordination at the highest operational level, with execution delegated to the lowest practical level and smallest capable unit.
- The different elements of the engineer force must work on tasks of a relatively similar importance to the Joint Task Force Commander's needs.
- Anticipatory planning is an absolute requirement! Even in emergency situations, engineer work is a function of planning and time.
- Engineer missions depend upon the ready availability of a variety of equipment, stores, and materials.
- Staff relationships depend upon the level and intensity of engineer requirements.

**a. *Centralized Coordination, Decentralized Execution.*** The execution of engineer tasks requires careful control and coordination of units, personnel, contractors, equipment, and materials. Engineers are always scarce! The most efficient use of scarce resources is generally achieved through centralized coordination at the highest operational level, with execution delegated to the lowest practical level and smallest capable unit. Centralized coordination will also preclude competition and “bidding wars” for scarce engineer construction materials

**b. *Allocation of Priorities.*** To assure the best use of engineer resources, senior commanders must assign priorities to most engineer projects. The completion of high priority tasks may require reallocation of resources from outside of engineer technical channels.

**c. *Engineer Early Planning.*** The successful engineer preparation of the theater depends upon the ready availability of units, equipment and materiel- including access to reserve forces. Anticipatory planning is an absolute requirement! Engineers must participate in the operational planning process from the onset of crisis planning since a surge of engineer effort is required at the beginning of any operation.

**d. *Logistics Support.*** The successful execution of engineer missions depends upon the ready availability of a variety of equipment, stores, and materiel. Most engineer supplies [mainly in Supply Classes IV (construction and barrier materials), Class V (demolitions), and Class IX (repair parts)], are high weight/high cube and are a challenge to move and store. Engineers must rely on logistics channels for these needs. Engineers should plan for local acquisition of as many resources (e.g., construction materials) as feasible so as to reduce strategic lift requirements.

**e. *Staff Relationships.*** Because of the close tie between tactical requirements and engineer work, the senior theater engineer must have a seat at the highest theater “council of war.” The joint theater engineer should have a first-hand and unfiltered understanding of the commander’s intentions. Several options present themselves for centralized command and control of the engineer work effort. Under most situations, a separate staff engineer relationship works well. The Joint Staff engineers works across all staff elements to coordinate policy, planning, and operations issues in support of the entire battlespace, all phases of operations, and funding requirements unique to construction. Principal staff agencies frequently requiring direct engineer consultation are in contracting, resourcing, operations, logistics, intelligence, and personnel.

**8. Conclusion.** Engineer units of all the services are inherently useful and versatile organizations and joint force commanders have engineering requirements that usually exceed available engineer work capacity. When engineering requirements and capabilities are coordinated centrally as in the person of a joint force engineer, scarce resources are effectively matched to the joint force commander’s concept of operations.

**To fully exploit military engineering at the operational level, the joint or combined force commander must recognize it as an essential aspect of his scheme of maneuver in an overall campaign plan involving naval, air, and land forces.**